Designing Locative and Social Media Technologies for Community Collaboration and Social Benefit: PetSearch

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ABSTRACT
The convergence of locative and social media with collaborative interfaces and data visualisation has expanded the potential of online information provision. Offering new ways for communities to share contextually specific information, it presents the opportunity to expand social media's current focus on micro self-publishing with applications that support communities to actively address areas of local need. This paper details the design and development of a prototype application that illustrates this potential. Entitled PetSearch, it was designed in collaboration with the Animal Welfare League of Queensland to support communities to map and locate lost, found and injured pets, and to build community engagement in animal welfare issues. We argue that, while established approaches to social and locative media provide a useful foundation for designing applications to harness social capital, they must be re-envisaged if they are to effectively facilitate community collaboration. We conclude by arguing that the principles of user engagement and co-operation employed in this project can be extrapolated to other online approaches that aim to facilitate co-operative problem solving for social benefit.

Author Keywords
Locative media, mobile applications, web technologies, dialogic, social benefit.

ACM Classification Keywords
H5.m. Information interfaces and presentation; HCI: Miscellaneous.

INTRODUCTION
RSPCA Australia recently reported that over 20 000 dogs and 36 000 cats were euthanised in Australia in a single year (2010: 2). These statistics represent an ongoing animal welfare issue and highlight the need to find more effective ways to reunite lost and injured pets with their owners and to rehouse abandoned animals. While we often see posters on lampposts and community centers advertising lost and found pets, or seeking a new home for an unwanted pet, their limited distribution and one-way communication restricts their affectivity. In a project entitled PetSearch (2010-11), the authors set out to investigate how a social media application could be designed to support community members to reduce the prevalence of lost and homeless animals. Working in collaboration with the Animal Welfare League of Queensland to solve this design problem, a co-design methodology led to combining elements of locative media (mobile phone, GPS, and online mapping applications) with social networking, data visualisation and collaborative interfaces.

In recent years, the convergence of locative media and collaborative interfaces has expanded the potential of online information provision and we were interested in exploring new ways of using technology to support communities to share contextually specific information in order to solve local problems. While the PetSearch project focused on designing an online solution for a particular community problem, at another level we were interested in establishing principles of user engagement, which might be extrapolated to other online approaches to co-operative problem solving for social benefit.

CO-DESIGN FOR LOCAL PROBLEM SOLVING: SUPPORTING ANIMAL WELFARE
Because the aim of the PetSearch project was to develop an application that facilitates community involvement and collaboration, we considered it important to involve local stakeholders from the outset. Therefore, alongside interaction design principles drawn from a contextual review of the fields of social, locative and persuasive media, the project employed participatory action research and co-design methods to shape the design of the PetSearch application. Co-design challenges the traditional design process (and its sole reliance on the design expert) by positioning stakeholders as co-designers of the application they will ultimately use. Sanders and Stappers (2008: 16) argue that co-design is best defined as "collective creativity as it is applied across the whole span of the design process." Co-design was appealing as a research approach to this project because it harnesses the explicit, as well as tacit, knowledge of stakeholders but also because it is "situation driven" and so helps to develop solutions to contextual problems by harnessing local community knowledge. For a project that has the objective of harnessing local social capital, this provided a particularly important underpinning.

Two stakeholder groups contributed to designing the functionality of the PetSearch application. Firstly, an Animal Welfare League of Queensland representative responded to detailed questionnaires on the organisation's needs and priorities prior to the project's commencement. This provided guidance on the project scope, objectives and overall approach. They established that their main

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objectives were to rehouse pets through their adoption services, and thereby lower the number of pets being euthanised, as well as to provide a reliable way for people to locate lost and found animals (given that "[some] *local governments don't have the funding or the motivation to develop on-line strategies to address it."*) However, because adoption services are provided by well-respected organisations like the RSPCA, and because the Animal Welfare League pointed out potential legal implications (*"If an individual keeps or rehomes an animal that has not passed a statutory period where it remains the legal property of the owner"*), it was determined that the PetSearch application would point to local pet adoption agencies mapped into the application. The application would primarily focus on lost, found and injured pets.

Besides helping to establish this broad goal, important ethical considerations were raised, which would also determine the scope and goals of the project. For example, it was pointed out that allowing the sale of pets through the application could lead to its use by unscrupulous 'puppy mills'. Therefore, safeguards were put in place by defining the terms of use. And, with regards to injured pets, it was argued that, "*Injured animals need to be taken to a vet so this would need to be factored into [the] program."* Therefore, while people can map where injured pets or wildlife have been sighted (to provide indications of hazards to other pet owners) it is emphasised in the application that injured animals should not be approached and a vet or agency (such as the Animal Welfare League or RSPCA) should be contacted. These ethical considerations led to educational information and referrals to local support services becoming integral to the design of the application.

These professional insights of the Animal Welfare League of Queensland were complemented by input from potential users of the application. In the research process for this project, two personas were developed, and then individuals were recruited through Facebook and email on the basis of this user profiling. Those who participated (N=13) completed a survey, with the responses contributing to the design of product features and tools. For example, all respondents commented on the necessity of including lost and found pet 'announcements' in alignment with 'last sighting' locations in a mapping application. They also all prioritised the ability to post pet memorials, and providing contact numbers and links for reporting mistreated animals. All of these priorities were incorporated into the application's design. Only two respondents saw a need for videos of pets and the ability to rate posts, so these aspects were not included. The direction provided by the respondents also helped to determine the application's architecture and its interaction, interface and information design.

Overall, the priorities, goals and considerations identified by the Animal Welfare League and representative end-users were around the need to supplement the formal, generic information provision of animal welfare agencies such as the RSPCA and the Animal Welfare League. While discouraging duplication of content and the rehousing functions that these well-established agencies provide, they highlighted the need for an additional, new model for supporting animal welfare. They called for an application that facilitates new ways for communities to co-operate to actively share local, contextually specific information to solve the problems of individual animals in moments of need. This drove an investigation into reconsidering the potential of social media, and encouraged us to look beyond the micro self-publishing that social networking enables in the interests of harnessing social capital and community goodwill to solve local community problems.

THE 'I' OF SOCIAL MEDIA AND THE 'WE' OF COLLABORATIVE MEDIA

Hatzipanagos and Warburton (2009: 51) have defined social media as software that supports "individual representation, mass interaction [and the] formation and communication of common-interest groups". This broad definition suits the goals identified in the initial scoping of the PetSearch application well. Moreover, the functionality found in well-known social networking applications like Facebook and Twitter offers some useful tools for achieving these goals. Some types of established social media functionality were therefore incorporated into the design of PetSearch, including the ability to post public notices of lost, found, and injured pets using a poster-generation tool (the poster can also be printed out as well as posted on the site). The application also deploys other social media conventions such as allowing users to 'self-publish' in various useful ways, such as developing a profile to describe one's interests in animal welfare, write blog posts and make comments on the posts of others. Private messaging and groups were provided to give members a place to discuss specific topics, and a discussion forum was included as a means for site members to publicly communicate on site and animal welfare issues. The principles of knowledge verification and moderation employed in social networks also provided a useful model, but they have been extended to provide a set of community rules and practices that address ethical and privacy issues.

While these strategies and tools of social networking provided a useful foundation, it is important to emphasise that what was required for the type of community engagement envisaged by the stakeholders was very different to that which is encouraged by established social networking applications. Social networking applications are predominantly designed to support individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse the connections of others within the system (Boyd and Ellison, 2007: 2). While the nature and nomenclature of such web-based services may vary from site to site, they largely share an enduring principle. That is, in micropublishing platforms like Twitter and Facebook, the individual (or business or other entity) is placed at the center and, through self-publishing and self-promotion, projects themselves into the social sphere, while drawing social connections around them. The focus of posts and comments is on 'I', conveyed to a personally created network. Designing purpose-built applications to serves quite different ends,

that is to facilitate community collaboration for social benefit, necessarily involves re-configuring this model. It requires a shift beyond a preoccupation with the self towards community collaboration for social benefit.

So far, locative technologies have largely been utilised to augment the capacity of social networking applications like Facebook by providing an additional layer of information to social networking. It has been argued by some academics, such as Naukkarinen, Sutela, Botero and Kommonen, (2009: 124) that locative media services have primarily been designed for the "most obvious purposes of navigation and way finding". However the potential of locative media is much greater than this. As Hamilton (2009: 2) notes, when combined with social media, it supports geo-spatial annotation through the tagging of site-specific content (image, sound, text) with spatial coordinates, and so can support geographically 'located' community collaboration in the production of online narratives of place. And, because of the capacity it provides to plot the locations of events over time, and to involve collaborative participation in the production of local community or neighbourhood resources, when combined with collaborative interfaces and the online visualisation of aggregated data, locative media also offers the possibility of a major shift in the way in which we think about the role of information sharing.

So far, few applications combine locative media with collaborative interfaces for the purpose of locating lost pets. Some applications, such as Lost and Found Pets Ireland www.lostandfoundpets.ie, Lost Pet Finders www.lostpetfinders.com.au, and Animal Finders Oxford www.animalfinders.co.uk, support users to pinpoint where animals were last seen on online maps. Ultimately however, these applications are little more than 'thing finders', with the thing in question being the lost pet, which may have now moved on.

Locative media offers the potential to combine collective intelligence on the location of lost pets with other capacities, such as tracking locations over time, showing relative lost and found locations and the geographical density of injured native animals, telling stories that complete abandonment with relocation, and indicating the prevalence of adoptions and other charitable acts (like donations to shelters) according to suburb in order to create a sense of community pride. That is, locative media provides the opportunity for automated information design and the visual display of complex data sets that go beyond clustering to bring relational relevance, narrative and community portraits to abstract information.

In concrete terms, this means that while locative functionality was included in PetSearch to help map lost, found, injured and reunited pets; other functionally was also integrated to extend the potential of community collaboration. For example, the application was designed to support community members to pinpoint injured pets, and the aggregation of this data flows into auto-generated information design, which visually shows the concentration of statistical incidence (hotspots) where pets and wildlife are at risk of injury. The location of local animal shelters and donation points supports the services of animal welfare organisations, and the application points directly to their web sites (so as not to replace their valuable information but complement and support them). Other locative functionality includes the capacity to pinpoint where pets have been rehoused, which serves to produce a temporal narrative outcome. And, collating the concentration of adoptions (as well as donations) in a resulting data visualisation, indicates which communities are highly active in supporting animal welfare. In addition, graphical representations of statistics related to the name and frequency of tags used (for topics posted in a neighbourhood state or territory) indicate the nature of local animal welfare concerns.

INCORPORATING PERSUASIVE MEDIA STRATEGIES

The design problems presented by organisations such as the Animal Welfare League require social co-operation and community collaboration. Strategies of persuasive media are useful in helping to encourage this community engagement. In a broad sense, persuasive media can be understood as "interactive computing systems designed to change people's attitudes or prompt behaviours" (Fogg 2003: 1). It recognises that the design of a technologies' affordances, structures and interfaces not only plays a vital role in improving users' access and use of technologies, it can also help them feel comfortable about making decisions and acting on them. In short, persuasive media focuses on the design of technologies to facilitate three essential elements of action–a trigger, along with the ability to act and motivation for pro-social behaviour.

Fogg (2003) argues that triggers can be provided through social opportunity, exploration, or fun. In the case of PetSearch, it is provided by an event (e.g. sighting a lost animal). Such a trigger must be accompanied by the ability to act, which can be increased by providing clearly articulated and easily accomplished steps to perform an action. This was ensured in the PetSearch application by adhering to usability principles as well as through the task analysis and recommendations of participants in the co-design process, which fed into the sequencing of actions and clear visual interfaces. A mobile version further increases the ability to act; as it ensures that PetSearch application users can access and add content at the moment they sight animals.

According to Fogg, (2003) motivation can be increased through various means, such as illustrating social norms, which can have a powerful effect on behavioural change, feedback on actions (relative to the actions of others), which leads to mutual benefit and increased trust, and status (online purchase sites employ this model). Various strategies have been employed in PetSearch to increase the motivation to participate. A points system for rating members' contributions, rankings for active users, and badges awarded at various ranking thresholds create an incentive to contribute and allow users to develop trust in each other and the community over time.

By providing a way for people to show where they have sighted and rehoused animals, and by collating this data (along with other statistics such as donations to shelters) into visualisations in graphs and maps, the extent of community contribution to animal welfare is displayed.

This helps to normalise the adoption and relocation of lost pets, and builds a sense of community achievement and pride. This is a salutogenic approach that harnesses community strengths to address to a social problem.

At the same time, safeguards have been established because locative media brings privacy and safety issues to the fore. Site users are not prompted to use their real name or map their residences in PetSearch, and mapping functionality is restricted to a neighbourhood/street level, giving a clear view of where the pet was sighted without revealing the location or identity of the user.

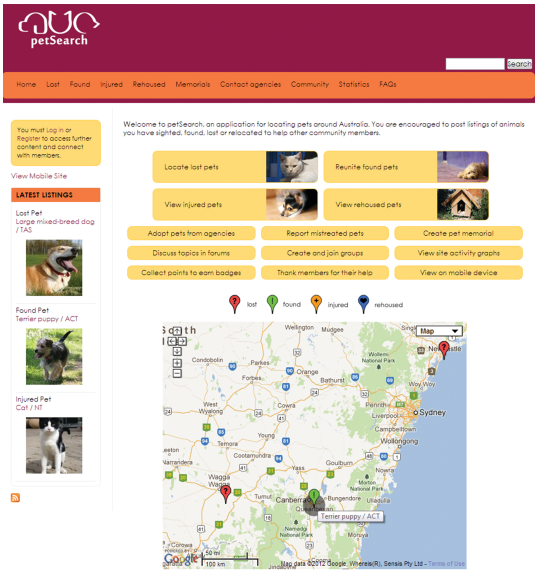

Figure 1. PetSearch homepage

PROJECT DEVELOPMENT

Through primary research into stakeholder needs and priorities, and a contextual and literature review which led to the (re)consideration of established approaches of social media and locative media tools, a set of design principles was established for the demonstrational version of the PetSearch application. These principles extend the current focus of social media by shifting its 'center' from 'I' to 'we', redefining its role by incorporating principles of persuasive media in order to increase participants' ability to respond to triggers (such as finding an injured animal) and by increasing the motivation to act. These principles underpin a design solution that will serve to increase community members' ability to track animal movements, report and locate pets, and collaborate in combining collective intelligence and co-operative approaches to animal welfare.

Because the application was developed for not-for-profit social benefit, it has a Creative Commons Attribution license applied to it (displayed in the application footer region). The principles of the Attribution license include free distribution of the software without royalties and fees, allowing modifications in derived works, while maintaining the integrity of the source code and attribution to the authors in all derivative works.

The PetSearch application was developed in Drupal, an open source content management system (CMS) that utilises modules for developing functionality. To increase accessibility, a mobile version was also created using a Drupal module and customisable theme.

CONCLUSION AND FUTURE DEVELOPMENTS

In this paper we have discussed the design process of a locative media application as a case study that exemplifies the potential of social and locative media to generate community co-operation and collaboration in responding to a perennial local problem. Design principles drawn from a co-design process, a review of social media and locative media's current conventions and goals, and the incorporation of strategies of persuasive media, have served to shift the impetus of the PetSearch project from a focus on 'I', which is seen in typical social media application, to a focus on a co-operative and collaborative 'we' for collective social benefit. It is our hope that the resulting PetSearch application can serve to reduce pressure on animal welfare agencies such as the Animal Welfare League and the RSPCA, and enable them to divert some of their limited resources to other animal welfare issues.

PetSearch, while currently a demonstrational prototype, has the potential for further development including implementation with its own domain name for the benefit of not-for-profit animal welfare organisations. By utilising its Creative Commons license, it could also be developed by individual agencies or local councils and modified to local contexts, conditions and user groups.

It is also our hope that the design principles established for this application can be extrapolated for use in the design of other social benefit applications. They are currently being tested through further research into designing online communities to provide social benefit to local agencies, and their clients and neighbourhoods.

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